PATENT SPECIFICATION

DRAWINGS ATTACHED

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911649

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COMPLETE SPECIFICATION

Improvements relating to Welding Guns

We, ELEKTRISKA SVETSNINGSAKTIEBOLAGET, a Swedish Company, of Herkulesgatan, Gothenburg, Sweden, do hereby declare this invention to be described in the following statement:—

This invention relates to welding guns for gas shielded consumable electrode arc welding of the type hereinafter referred to as "the type specified") comprising a first tubular guide for electrode wire entering the gun from a supply thereof, driving means for drawing the wire through the guide and passing it into one end of a metallic second tubular guide which is surrounded by a gas passage terminating in a nozzle at or adjacent the other end of the second guide and which constitutes a current carrying shoe for supplying direct current to the wire.

In gas shielded consumable electrode arc welding it is desirable, when using fine gauge electrode wire that the latter should have a high linear speed in order to deposit weld material at an acceptable rate and it is essential, for good quality welding that the wire speed should be as steady as possible and in particular that it should not be subject to sudden fluctuations. Furthermore it is desirable that the driving means for the wire should have comparatively little inertia so that substantialy instant stopping and starting of the wire may be accomplished.

In the past a number of welding guns have been proposed in which the driving means has been located outside the gun itself to push the wire through a flexible conduit into the gun but with this arrangement it has been found difficult to maintain the desired steady wire speed. Furthermore, the maximum length of flexible conduit used has been about six feet which imposes limitations on the use of the gun. In constructions of the type specified, where the wire is pulled through a flexible conduit constituting said first tubular guide the gun has included an electric motor to operate the driving means but it has been found impossible, in practice, to obtain sufficient power in a readily handled, manually operable gun to feed a fine wire at sufficient speed through a long flexible conduit.

As a result of this it has been found necessary to mount a small reel of wire on the gun itself but this adds considerably to the weight of the gun and is a disadvantage when the gun has to be handled by an operator over long periods. Also the provision of small reels of wire may double the cost of the latter in comparison with larger reels. Also the moving parts of an electric motor have sufficient inertia to render substantially instant stopping and starting of the wire difficult to achieve.

In addition when an electric motor is incorporated in the gun it is not readily possible to provide for smooth speed variation in the wire controlled from the gun itself such speed variation which also varies the welding current is desirable particularly for sheet metal work.

It is therefore an object of the present invention to provide an improved welding gun of the type specified which, in particular, incorporates improved driving means.

The weight of the equipment handled by the operator is provided partly by the gun itself and partly by connections to static equipment. In particular the weight of electric cables for feeding current to the wire (and any cooling means therefor) has been considerable and it is a further object of the invention to provide a gun in which such cables may be of comparatively low weight and effectively cooled.

According to the present invention there is provided a welding gun of the type specified in which, the driving means comprises a friction driving wheel, a pneumatic motor and operative connections between the motor and the driving wheel to rotate the latter, the motor being mounted upon and forming part of the gun. Preferably the pneumatic motor forms the

handle part of the gun. The driving wheel may be electricaly insulated from the remainder of the gun and formed with a peripheral groove to receive the wire. Preferably a freely rotating electrically insulated idler wheel is resiliently urged against the wire to hold the latter in driving engagement with the driving wheel.

The driving means may be located within a chamber communicating only with said guide tubes and the gas passage and gas may be introduced into the gun through a gas tube surrounding the inner end of said first tubular guide. The first tubular guide may be of flexible material such as polytetrafluorethylene loosely disposed within a nylon gas tube. Advantageously cables for supplying electric current to the wire are passed through a supply line for the motor so that the former are constantly cooled during operation of the motor.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Fig. 1 shows a welding gun in side elevation and partial section and,

Fig. 2 is a top view of part of the gun with a cover removed.

Referring to the drawings the welding gun comprises a barrel part 1 and a handle part 2 the latter comprising a pneumatic motor of a length and diameter to be a comfortable fit in an operator's hand. An air supply line 3 for the motor is connected thereto at one end and an output shaft 5 extends outwardly of the other end of the motor and carries a friction driving wheel 6 mounted upon an electrically insulated bush 7. The wheel 6 is formed with a peripheral groove 8. The driving wheel 6 projects within a housing 9 secured to the associated end of the motor and the barrel part 1 extends transversely of the handle 2 and is also secured to the housing 9.

A tube 10 extends outwardly of a wall of the housing and has the projection of its axis tangentially of the groove 8 in the driving wheel 6. The tube receives the inner end of a gas inlet pipe 11 formed with an appropriate junction (not shown) for connection to a source of carbon dioxide. The pipe 11 may be of nylon and a first tubular guide 12 of polytrafluorethylene is disposed loosely within the pipe 11 and passes through a suitable gland (not shown) at the outer end thereof. The inner end of the guide 12 terminates adjacent the inner end of the pipe 11 and the outer end of the guide 12 extends to a conveniently disposed reel (not shown) of welding wire. The internal diameter of the first guide 12 is such that wire from the reel may pass freely through it and may for example be 1/16th inch the gas pipe 11 having an internal diameter of 5/16th inch. A guide post 13 is mounted within the housing 9 and is formed with a bore in line with the axis of the tube 10 to receive an electrically insulated tubular bush 14 having a tapered end 15 to serve as a guide for the welding wire.

The barrel part 1 comprises a second metallic tubular guide 16 constituting a current carrying shoe supported co-axially within a tubular gas passage 17. The inner end of the passage 17 is outwardly flared to be retained against one end of an externally threaded electrically insulated boss 18 by a knurled cap 19. The boss 18 is formed with a central bore through which the guide 16 passes. The bore is flared to receive a split tapered collet 20 carried by the inner end 21 of a bus bar 22 which is disposed between the boss 18 and a washer 23. The boss 18 is secured to the housing 9 by screws (not shown) and the assembly is formed with three equi-spaced apertures 24 communicating between the interior of the housing 9 and the inner end of the gas passage 17. As shown in Figs. 1 and 2 the bore of the guide 16 is co-linear with the axis of the tube 10. At its outer end the guide 16 is supported in a central bore of an electrically insulated member 25 formed with three equi-spaced longitudinal apertures 26. A replaceable nozzle 27 is provided for the guide 16 and a nozzle 28 extending beyond the nozzle 27 is screwed to the outer end of the gas passage 17. The nozzle 28 is inwardly and then outwardly tapered respectively at 29 and 30 and at least the outwardly tapered part 30 is chromium plated and highly polished to hinder the adhesion of spatter thereto.

It will be appreciated that connection of the barrel assembly to the housing 9 causes the collet 20 to tighten around the guide 16 and achieve good electrical connection with the bus bar 22. This latter extends alongside and in front of the motor so as to provide a radiation shield for the operator's hand. Electrical connection is made between the outer end 31 of the bus bar and a cable (not shown) which passes through tube 3 feeding air to the motor and which is in turn connected to a suitable source of direct current that may, for example, having a rising volt/amp characteristic. The motor casing incorporates a micro switch 32 connected to operate a relay for controlling supply of direct current to the gun. The switch 32 is operable upon initial movement of a lever 33 controlling the air supply to the motor. Closure of the switch 32 preferably also controls supply of gas to the gas pipe 11.

An electrically insulated idler wheel 34 is freely rotatable in bearings carried by a carriage 35 one end of which is pivotably located in a notch 36 in the housing 9 and the other end of which is urged in a clockwise direction (as viewed in Fig. 2) by a leaf spring 37 so that the periphery of the wheel 34 is urged towards the periphery of the driving wheel 6.

The upper part of the housing 9 is closed by a cover 38 retained by screws (not shown).

In operation welding wire from a supply reel is passed through the first tubular guide

12 between the groove 8 of the driving wheel 6 and the idler wheel 34 and through the second tubular guide 16, contact with the interior of which supplies direct current to the wire. Carbon dioxide or other arc shielding gas or gases is supplied through the gas inlet pipe 11 to pass through the housing 9 and along the gas passage 17 surrounding the second tubular guide 16. Welding with the gun is effected in known manner and it has been found that with the construction above-described and particularly by using a pneumatic motor a substantially constant linear driving speed can be smoothly imparted to the wire while stopping the motor causes substantially instantaneous stopping of the wire. The wire speed and therefore the welding current can also be readily varied and by passing the direct current supply cable through the air line the former is cooled so that a cable of comparatively low weight may be used. Furthermore by extending the first tubular guide 12 to the wire supply reel substantially no air is drawn into the gun with the wire so reducing contamination of the latter.

In addition by using a driving wheel mounted on an electrically insulated bush and a gas passage 17 electrically insulated from the remainder of the gun there is no danger of accidental "flashes" occurring between the gun and a workpiece.

It is desirable that the groove 8 on the driving wheel 6 should be of smooth configuration so as not to cause any distortion to the surface of the wire as the latter passes along it, thus ensuring that the wire has a satisfactory surface for picking up current from the second guide. In a modification the outer end of this guide may be formed with three sectors in the form of a readily adjustable split collet so that compensation for bore wear may be provided.

As examples only the following table sets out welding parameters which have been found most suitable, in all cases it being assumed that the welding wire is an iron alloy containing 0.16% carbon, 1.9% manganese, 0.78% silicon, 0.05% sulphur, 0.03% phosphorous and 0.07% titanium, the gun being operated with a current density of 100,000 to 200,000 amps per square inch and with an arc length of less than 3/32".

Wire Size in inches	Current Range in amps	Wire Speed in inches/min.	Arc Voltage
.025	50	250	20
"	100	500	24
.035	100	240	22
"	200	480	26
.050	175	230	24
"	350	460	28

WHAT WE CLAIM IS:—

1. A welding gun of the type specified in which the driving means comprises a friction driving wheel, a pneumatic motor and operative connections between the motor and the driving wheel to rotate the latter, the motor being mounted upon and forming part of the gun.

2. A welding gun according to claim 1 in which the pneumatic motor forms the handle part of the gun.

3. A welding gun according to claim 1 or claim 2 in which the driving wheel is electricaly insulated from the remainder of the gun and is formed with a peripheral groove to receive the wire.

4. A welding gun according to claim 1 or claim 2 or claim 3 in which a freely rotating electrically insulated idler wheel is resiliently urged against the wire to hold the latter in driving engagement with the driving wheel.

5. A welding gun according to any one of the precdeing claims in which the driving means is located within a chamber communicating only with said guide tubes and the gas passage and in which gas may be introduced into the gun through a gas pipe surrounding the inner end of said first tubular guide.

6. A welding gun according to claim 5 in which the first tubular guide is of flexible material such as polytetrafluorethylene and is loosely disposed within a nylon gas pipe.

7. A welding gun according to any one of the preceding claims in which cables for supplying electric current to the wire are passed through an air supply line for the motor so that the former are constantly cooled during operation of the motor.

8. A welding gun substantially as herein described with reference to Fig. 1 and Fig. 2 of the accompanying drawings.

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Fig. 1.

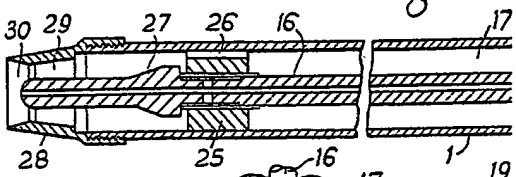
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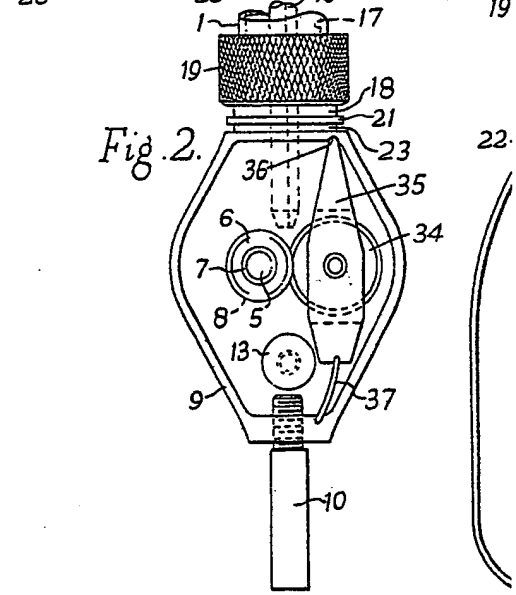
Fig. 2.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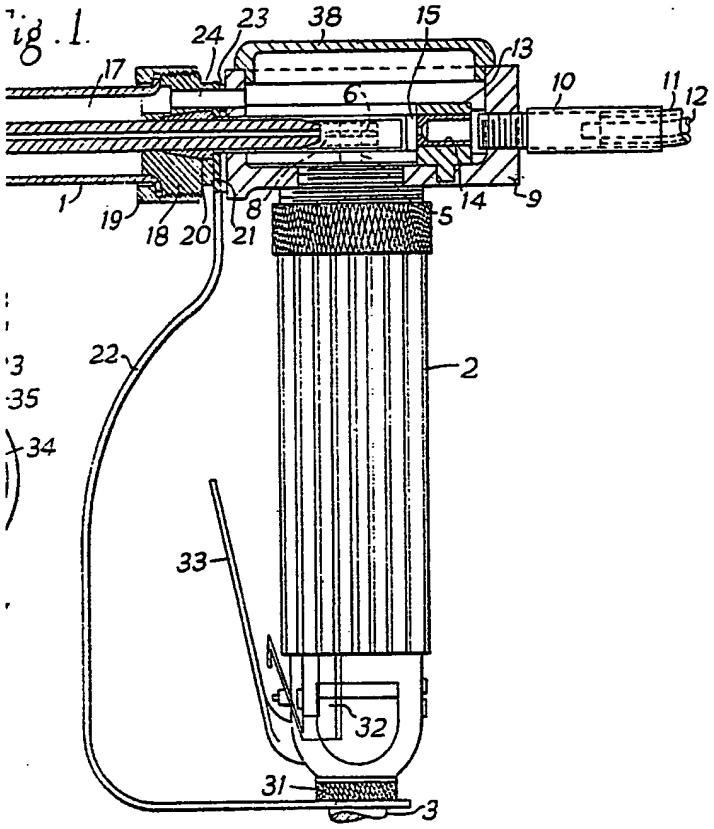

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Fig. 1.

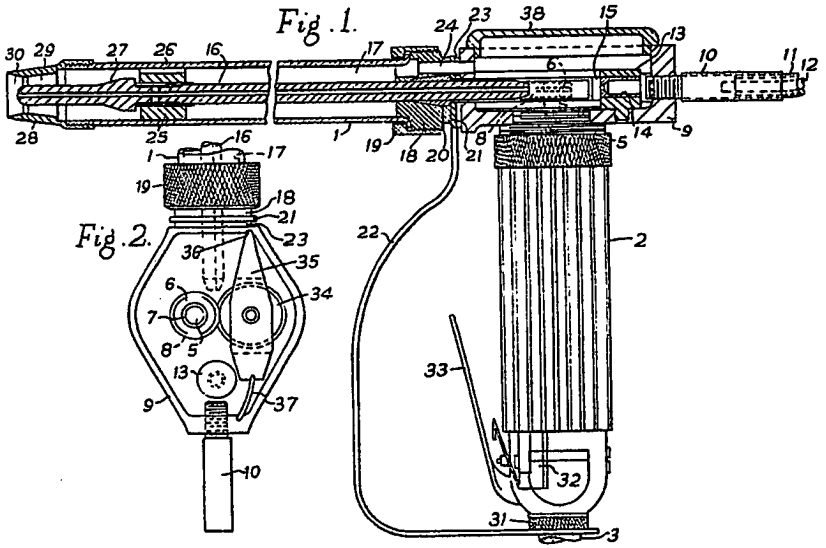

Fig. 2.